

AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1 - 19. (Cancelled).

20. (Currently Amended) A computer implemented method ~~to generate runtime code~~ for optimizing image execution that balances competing requirements of the higher performance of native compilation and the development time benefits provided by intermediate language systems, comprising the following computer executable acts:

an execution engine in the virtual execution environment receiving an intermediate language image;

the execution engine determining the appropriate execution mode for executing the functionality represented by the intermediate language image, the appropriate execution mode selected from among (a) Just-In-Time processing of the intermediate language image within the virtual execution environment and (b) execution of a compiled native code executable on an underlying platform providing the virtual environment, including:

the execution engine searching a native image repository for previously compiled native code executables corresponding to the intermediate language image that match environment characteristics of the underlying platform, the previously compiled native code executables stored along with tags indicating environment characteristics for platforms for which the native code executables are valid, each native code executable stored in the image repository having been previously specialized from some intermediate language image for native execution on a platform having specified environment characteristics; and

the execution engine determining that a matching native code executable compiled for native execution on the underlying platform is not available in the native image repository;

the execution engine processing the intermediate language image in accordance with Just-In-Time processing in response to determining that a native code executable for

execution on the underlying platform is not available in the native image repository;
determining a first code image associated with a possible runtime environment;
executing the first code image in an unmodified form in the runtime environment; and
generating runtime feedback associated with the first code image and a particular user to
adjust a subsequent code image according to the runtime environment, the feedback includes at
least a set of information to create a code image according to the particular user.

21. (Currently Amended) The method of claim [[20]]24, further comprising: [[,]]
a native image generator accessing the intermediate language image and the
environment characteristics of the underlying platform from the native image log;
the native image generator generating a specialized executable native code
executable for native execution on the underlying platform, the specialized native code
executable generated from the subsequent code intermediate language image based on the
environment characteristics; and
the native image generator storing the specialized native code executable in the
native image repository.

22. (Currently Amended) The method of claim 21, further comprising subsequent to
the native image generator storing the specialized native code executable in the native image
repository; - storing the specialized executable in an image repository.

the execution engine again receiving the intermediate language image;
the execution engine again searching the native image repository for previously
stored native code executables corresponding to the intermediate language image that
match environment characteristics of the underlying platform;
the execution engine determining that the specialized native code executable is
available for native execution on the underlying platform;
the execution engine accessing the specialized native code executable from the
native image repository; and
executing the specialized native code executable on the underlying platform in
lieu of processing the intermediate language image in accordance with Just-In-Time
processing.

23. (Currently Amended) The method of claim 21, further ~~comprising, wherein~~
generating the specialized native code executable comprising processing a generic the
intermediate language image utilizing standard compilation techniques.

24. (Currently Amended) The method of claim ~~[[23]]~~20, further comprising~~[[(:)]the~~
execution engine logging the intermediate language image along with environment
characteristics of the underlying platform into a native image log, the environment
characteristics of the underlying platform obtained during processing of the intermediate
language image in accordance with the Just-In-Time processing, the native image log providing
input to a native image generator that generates native code executables from intermediate
language images and corresponding environment characteristics, the native code executables for
native execution on corresponding platforms logging operating environment information during
processing of the generic image.

Claims 25 - 33. (Cancelled).

34. (New) A computer program product for use at a computer system, the computer program product for implementing a method for optimizing image execution that balances competing requirements of the higher performance of native compilation and the development time benefits provided by intermediate language systems, the computer program product comprising one or more computer storage media having stored thereon computer-executable instructions that, when executed at a processor, cause the virtual environment to perform the method, including the following:

- receive an intermediate language image;

- determine the appropriate execution mode for executing the functionality represented by the intermediate language image, the appropriate execution mode selected from among (a) Just-In-Time processing of the intermediate language image within the virtual execution environment and (b) execution of a compiled native code executable on an underlying platform providing the virtual environment, including:

 - searching a native image repository for previously compiled native code executables corresponding to the intermediate language image that match environment characteristics of the underlying platform, the previously compiled native code executables stored along with tags indicating environment characteristics for platforms for which the native code executables are valid, each native code executable stored in the image repository having been previously specialized from some intermediate language image for native execution on a platform having specified environment characteristics;

 - determining that a matching native code executable compiled for native execution on the underlying platform is not available in the native image repository;

- process the intermediate language image in accordance with Just-In-Time processing in response to determining that a native code executable for execution on the underlying platform is not available in the native image repository.

35. (New) The computer program product of claim 34, further comprising computer executable instructions that, when executed, cause the computer system to log the intermediate language image along with environment characteristics of the underlying platform into a native

image log, the environment characteristics of the underlying platform obtained during processing of the intermediate language image in accordance with the Just-In-Time processing, the native image log providing input to a native image generator that generates native code executables from intermediate language images and corresponding environment characteristics, the native code executables for native execution on corresponding platforms.

36. (New) The computer program product of claim 35, further comprising computer executable instructions that, when executed, cause the computer system to:

- access the intermediate language image and the environment characteristics of the underlying platform from the native image log;

- generate a specialized native code executable for native execution on the underlying platform, the specialized native code executable generated from the intermediate language image based on the environment characteristics; and

- store the specialized native code executable in the native image repository.

37. (New) The computer program product of claim 36, further comprising computer executable instructions that, when executed, cause the computer system to subsequent to the native image generator storing the specialized native code executable in the native image repository:

- receive the intermediate language image again;

- searching the native image repository for previously stored native code executables corresponding to the intermediate language image again;

- determine that the specialized native code executable is available for native execution on the underlying platform;

- access the specialized native code executable from the native image repository;
- and

- execute the specialized native code executable on the underlying platform in lieu of processing the intermediate language image in accordance with Just-In-Time processing.

38. (New) The computer program product of claim 36, wherein computer executable instructions that, when executed, cause the computer system to generate the specialized native code executable comprise computer executable instructions that, when executed, cause the computer system to process the intermediate language image utilizing standard compilation techniques.

39. (New) A computer system, the computer system including a platform that provides a virtual environment for executing intermediate language images, the computer system comprising:

- a processor;

- system memory;

- a native image log, the native image log entries for one or more intermediate language images, each entry including image information for an intermediate language image and corresponding environment characteristics of the platform where the intermediate language image was executed, the environment characteristics of the platform obtained during processing of the intermediate language image in accordance with Just-In-Time processing;

- a native image repository, the native image repository containing native code executables stored along with tags indicating environment characteristics for platforms for which the native code executables are valid, each native code executable stored in the image repository having been previously specialized from some intermediate language image for native execution on a platform having specified environment characteristics

- one or more computer storage media having stored thereon computer-executable instructions representing an execution engine, a native image service, and a native image generator, wherein the execution engine is configured to:

 - receive an intermediate language image;

 - determine the appropriate execution mode for executing the functionality represented by the intermediate language image, the appropriate execution mode selected from among (a) Just-In-Time processing of the intermediate language image within the virtual execution environment and (b) execution of a compiled native code executable on the platform, including:

 - searching the native image repository for a previously compiled native code executable corresponding to the intermediate language image that match environment characteristics of the platform;

 - when no previously compiled native code executable is found:

 - process the intermediate language image in accordance with Just-In-Time processing;

obtain environment characteristics of the platform during processing of the intermediate language image in accordance with Just-In-Time processing; and

log the image information for the intermediate language image along with environment characteristics of the platform into a native image log;

when a previously compiled native code executable is found:

access the previously compiled native code executable from the native image repository; and

execute the previously compiled native code executable on the platform in lieu of processing the intermediate language image in accordance with Just-In-Time processing;

wherein the native image service is configured to:

read the image information and environment characteristics for intermediate language images from the native image log; and

forward the image information and environment characteristics to the native image generator; and

wherein the native image generator is configured to:

receive the image information and environment characteristics from the native image service;

compile a specialized native code executable for native execution on the platform based on the image information and environment characteristics; and

store the specialized native code executable in the native image repository.

40. (New) A computer program product for use at a computer system, the computer program product for implementing a method for optimizing image execution that balances competing requirements of the higher performance of native compilation and the development time benefits provided by intermediate language systems, the computer program product comprising one or more computer storage media having stored thereon computer-executable instructions that, when executed at a processor, cause the virtual environment to perform the method, including the following:

- receive an intermediate language image;

- determine the appropriate execution mode for executing the functionality represented by the intermediate language image, the appropriate execution mode selected from among: (a) Just-In-Time execution using the virtual execution environment and (b) execution of a compiled native code executable on an underlying platform that provides the virtual environment, including:

- searching a native image repository for previously compiled native code executables corresponding to the intermediate language image that match environment characteristics of the underlying platform, the previously compiled native code executables stored along with tags indicating environment characteristics for platforms for which the native code executables are valid, each native code executable stored in the image repository having been previously specialized from some intermediate language image for native execution on a platform having specified environment characteristics; and

- determining that a previously compiled native code executable corresponding to the intermediate language image is available for native execution on the underlying platform;

- access the previously compiled native code executable from the native image repository; and

- execute the previously compiled native code executable on the underlying platform in lieu of processing the intermediate language image in accordance with Just-In-Time execution.